

REMARKS

Applicants have canceled claims 13-18 as being drawn to a non-elected invention. Applicants have added three new claims, but no additional fee should be due because of the cancellation of the other claims. Applicants respectfully traverse the rejection of the claims under 35 U.S.C. §112 and §103 and respectfully request reconsideration.

In regard to the rejection of claims 2-3 and 8 under 35 U.S.C. §112, applicants respectfully disagree with the examiner. The preferred dielectric film 31 is formed from a polyimide material that does not melt, rather under high temperatures, it may char. By way of example, Applicants are enclosing published literature concerning the characteristics of Kapton, which is the polyamide material used in the preferred embodiment. Page 1 mentions that it does not melt or burn. Page 3 of 6 mentions that it chars but does not burn in air. The literature states that in an atmosphere of 95 percent oxygen, and with an ignition source present, the material will burn.

In the preferred embodiment, a carrier film 35 is fused to dielectric film 31 to retain dielectric film 31 in the shape of a tube. Carrier film 35 may be of a variety of types of thermoplastic that melts and fuse. When strips of dielectric film 31 and carrier film 35 are placed against each other and spiral-wound to create overlapping edges, heat can be applied to the overlapping edges to cause sufficient melting of the carrier film 35 to fuse to the dielectric film 31. The combination of the two films thus provides in the preferred embodiment a continuous sidewall for the dielectric tube 29.

The references do not suggest the invention. Tsubokawa shows two insulation films 10A and 10B made of materials having different dielectric constants from each other. These films are

folded into a U-shape and placed in the slot. After coils 11 are inserted into each slot, a wedge-form insulation film 12 is placed against coils 11, retaining them within slot 9. Insulation films 10A and 10B do not form a continuous tube as stated by the examiner. There is no mention in the patent whether or not the insulation films 10A and 10B are fused together, but even if they were fused together, they do not form a continuous wall.

Applicants submit that dielectric films 10A and 10B are formed into a U-shape so that coils 11 may be inserted from the central opening of stator 2 through the gap between the two edges of dielectric film 10A and 10B into slot 9. The gap between the two edges of dielectric films 10A and 10B is subsequently blocked with wedge-form insulation film 12. If dielectric films 10A and 10B were fused into a continuous wall shape, there would be no gap to insert the windings, and the windings would have to be inserted from the opposite ends of the stator. There would be no reason to have wedge-form insulation film 12 if the dielectric films 10A and 10B were fused into a continuous wall shape. With Applicants' continuous sidewall tube 29, the windings cannot be inserted from the central opening of the stator into the slots. Rather, the windings are inserted from opposite ends of the tube.

Beckman shows a slot liner 302 that enables insertion of the windings from opening 216. Beckman teaches deflecting flaps 311A and 311B to create a longitudinally extending overlapping edge that aligns with slot opening 216. Flaps 311A-B are not fused together because they must deflect in order to allow windings 122 to be passed from the central opening of the stator through opening 216 (Figure 2). Column 6, lines 4-7 states:

As the wire is wrapped, the flaps 311A-B deflect to permit insertion of the wire into the radially facing opening 216 of the slot 204.

Column 6, lines13-15 states that the flaps 311A-B return to their nondeflected position after the windings are inserted into the slot. Line18 mentions that flaps 311A-B avoid the need for inserting insulating wedges to provide insulative coverage at the surfaces 233 of flanges 231. Such wedges are taught in Tsubokawa indicated by the numeral 12.

Combining Tsubokawa with Beckman would not achieve the claimed feature of this invention. The combination would teach two deflecting flaps, such as flaps 311A and 311B at the inner end of the U-shaped dielectric films 10A and 10B. These flaps would not be bonded because Beckman teaches that the windings 11 must be inserted through them. If the edges were bonded to form a continuous side wall, it would destroy the teachings of both references, which is to allow insertion of the windings from the central opening of the stator into the slots rather than require insertion of the windings into the ends of the slots.

Claim 1 requires a tube of dielectric film, each tube defining a sealed outer margin. This is not suggested by either reference. The references singly or combined teach an outer margin that has an axially extending opening for the insertion of windings from the central opening of the stator.

Claim 2 depends from claim 1 requiring that the dielectric film be nonmeltable. The references do not suggest a dielectric film that has a continuous sidewall and is nonmeltable. Nonmeltable dielectric films for slot liners are known in the prior art, but not configured in a tube with a continuous sidewall.

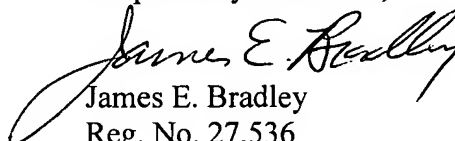
Claim 3 requires that the dielectric film be nonmeltable and be bonded to a carrier layer of a meltable material. Slot liners of meltable material are known in the art, but not fused to a nonmeltable dielectric film to form a continuous sidewall.

Claim 8 requires a layer of a dielectric film that has overlapping edges and which is bonded to a layer of a material that fuses to the dielectric film to form a continuous sidewall. This combination is not shown or suggested in the references, as mentioned.

New claim 20 requires each of the tubes comprise a layer of a dielectric film and a layer of a carrier material that are spiral-wound together to create overlapping edges, the overlapping edges being heat-fused together to form a continuous sidewall. The term "spiral-wound" is mentioned in the specification on page 6, line 9. When a strip of material is spiral-wound, it creates a tube with a helical overlapping edge extending along its length. The overlapping flaps of Beckman must be straight and parallel to opening 16 (Figure 2) to allow the insertion of windings 122. Slot liner 302 thus could not be spiral-wound because the overlapping flaps would then not be parallel to opening 216, rather they would be helical. As mentioned, Beckman teaches away from heat fusing the overlapping flaps together to form a continuous sidewall because Beckman teaches that the flaps deflect to allow insertion of windings 122.

It is respectfully submitted that the claims are now in condition for allowance and favorable action is respectfully requested.

Respectfully submitted,


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General Information**General Information**

Kapton® polyimide film possesses a unique combination of properties that make it ideal for a variety of applications in many different industries. The ability of Kapton® to maintain its excellent physical, electrical, and mechanical properties over a wide temperature range has opened new design and application areas to plastic films.

Kapton® is synthesized by polymerizing an aromatic dianhydride and an aromatic diamine. It has excellent chemical resistance; there are no known organic solvents for the film.

→ Kapton® does not melt or burn as it has the highest UL-94 flammability rating: V-0. The outstanding properties of Kapton® permit it to be used at both high and low temperature extremes where other organic polymeric materials would not be functional.

Adhesives are available for bonding Kapton® to itself and to metals, various paper types, and other films.

Kapton® polyimide film can be used in a variety of electrical and electronic insulation applications: wire and cable tapes, formed coil insulation, substrates for flexible printed circuits, motor slot liners, magnet wire insulation, transformer and capacitor insulation, magnetic and pressure-sensitive tapes, and tubing. Many of these applications are based on the excellent balance of electrical, thermal, mechanical, physical, and chemical properties of Kapton® over a wide range of temperatures. It is this combination of useful properties at temperature extremes that makes Kapton® a unique industrial material.

Three types of Kapton® are described in this bulletin:

- Kapton® Type HN, all-polyimide film, has been used successfully in applications at temperatures as low as -269°C (-452°F) and as high as 400°C (752°F).

Type HN film can be laminated, metallized, punched, formed, or adhesive coated. It is available as 7.5 µm (0.3 mil), 12.5 µm (0.5 mil), 19 µm (0.75 mil), 25 µm (1 mil), 50 µm (2 mil), 75 µm (3 mil), and 125 µm (5 mil) films.

- Kapton® Type VN, all-polyimide film with all of the properties of Type HN, plus superior dimensional stability. Type VN is available as 12.5 µm (0.5 mil), 19 µm (0.75 mil), 25 µm (1 mil), 50 µm (2 mil), 75 µm (3 mil), and 125 µm (5 mil) films.
- Kapton® Type FN, a Type HN film coated on one or both sides with Teflon® FEP fluoropolymer resin, imparts heat sealability, provides a moisture barrier, and enhances chemical resistance. Type FN is available in a number of combinations of polyimide and Teflon® FEP thicknesses (see Table 16).

Note: In addition to these three types of Kapton®, films are available with the following attributes:

- antistat
- thermally conductive
- polyimides for fine line circuitry
- cryogenic insulation
- corona resistant
- pigmented for color
- conformable
- other films tailored to meet customers' needs

Data for these films are covered in separate product bulletins, which can be obtained from your DuPont representative.

The Chemical Abstracts Service Registry Number for Kapton® polyimide film is [25036-53-7].

Thermal Aging

The useful life of Kapton® polyimide film is a function of both temperature and oxygen concentration. In accordance with UL-746B test procedures, the thermal life of Kapton® was

determined at various temperatures. At time zero and 325°C (617°F), the tensile strength is 234 MPa (34,000 psi) and the elongation is 67%. The results are shown in Figures 6-8.

Figure 6. Tensile Strength vs. Aging in Air at 325°C (617°F), Type HN Film, 25 µm (1 mil)

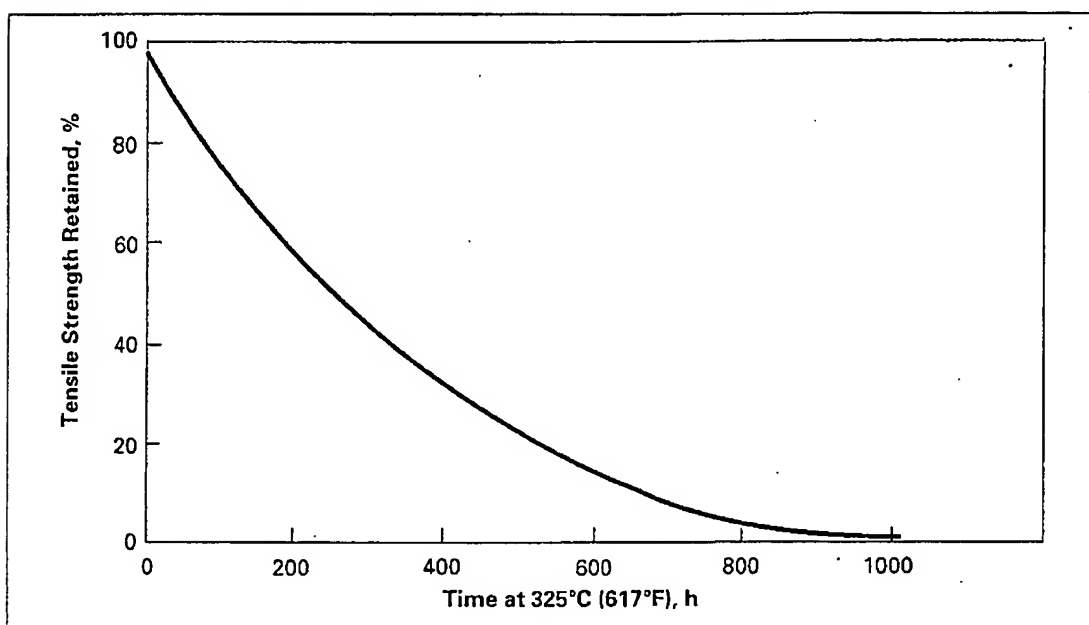


Figure 7. Ultimate Elongation vs. Aging in Air at 325°C (617°F), Type HN Film, 25 µm (1 mil)

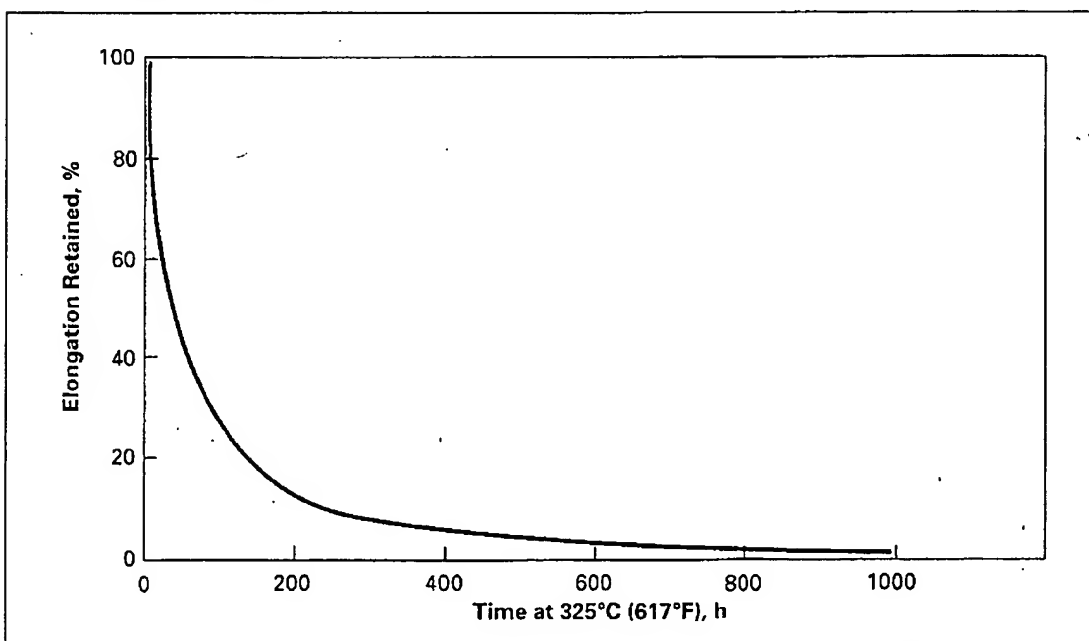
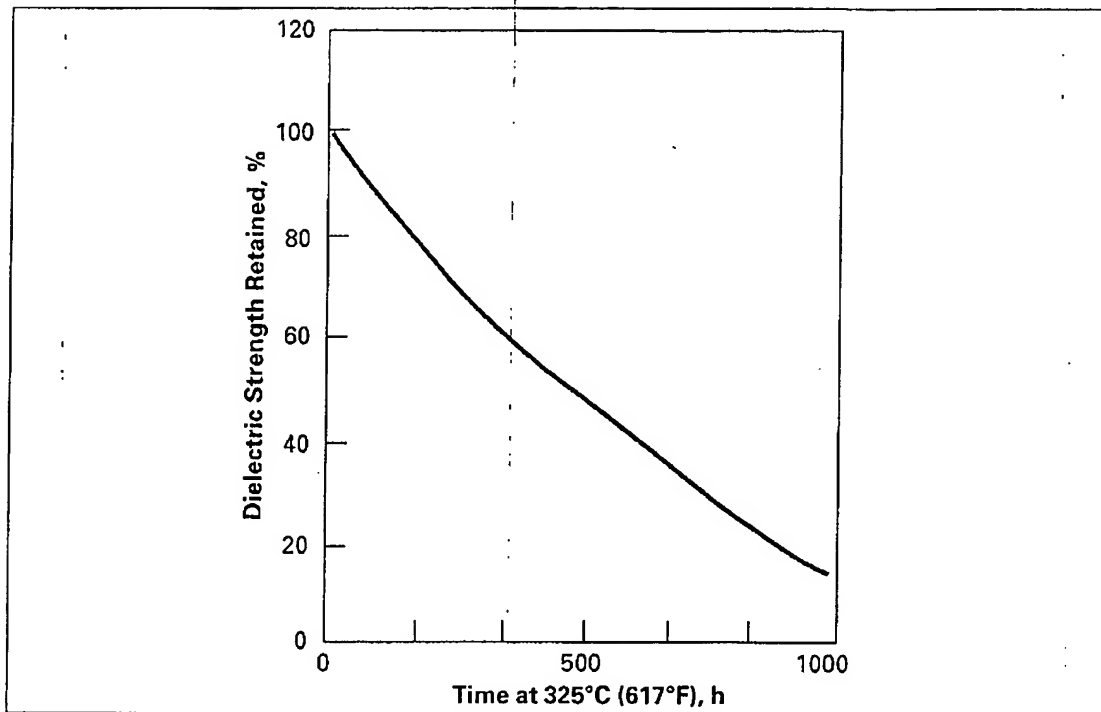


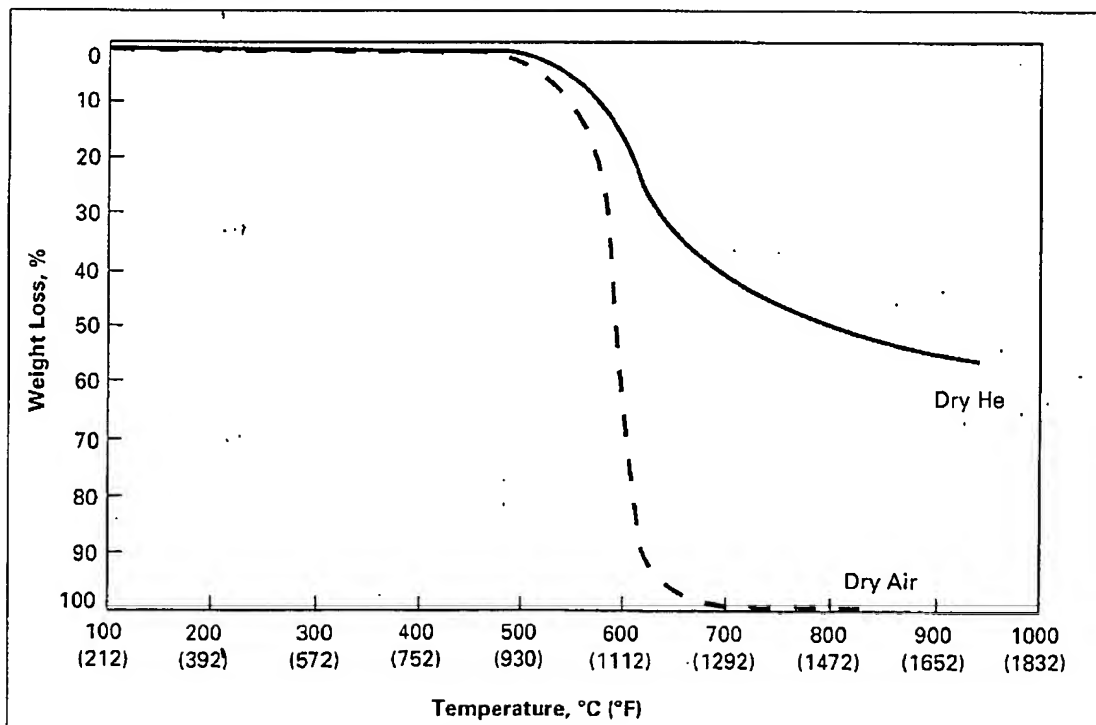
Figure 8. Retained Dielectric Strength at 325°C (617°F) for 25 μ m (1 mil) Film, Test Method UL-746B



→ The life of Kapton® polyimide film at high temperature is significantly extended in a low-oxygen environment. Kapton® is subject to oxidative degradation. Hence, when it was tested in a helium environment, its useful life

was at least an order of magnitude greater than in air. Using a DuPont 1090 thermal analyzer system, the weight loss characteristics of Kapton® in air and helium at elevated temperatures are shown in Figures 9 and 10.

Figure 9. Weight Loss, Type HN Film, 25 μ m (1 mil)*

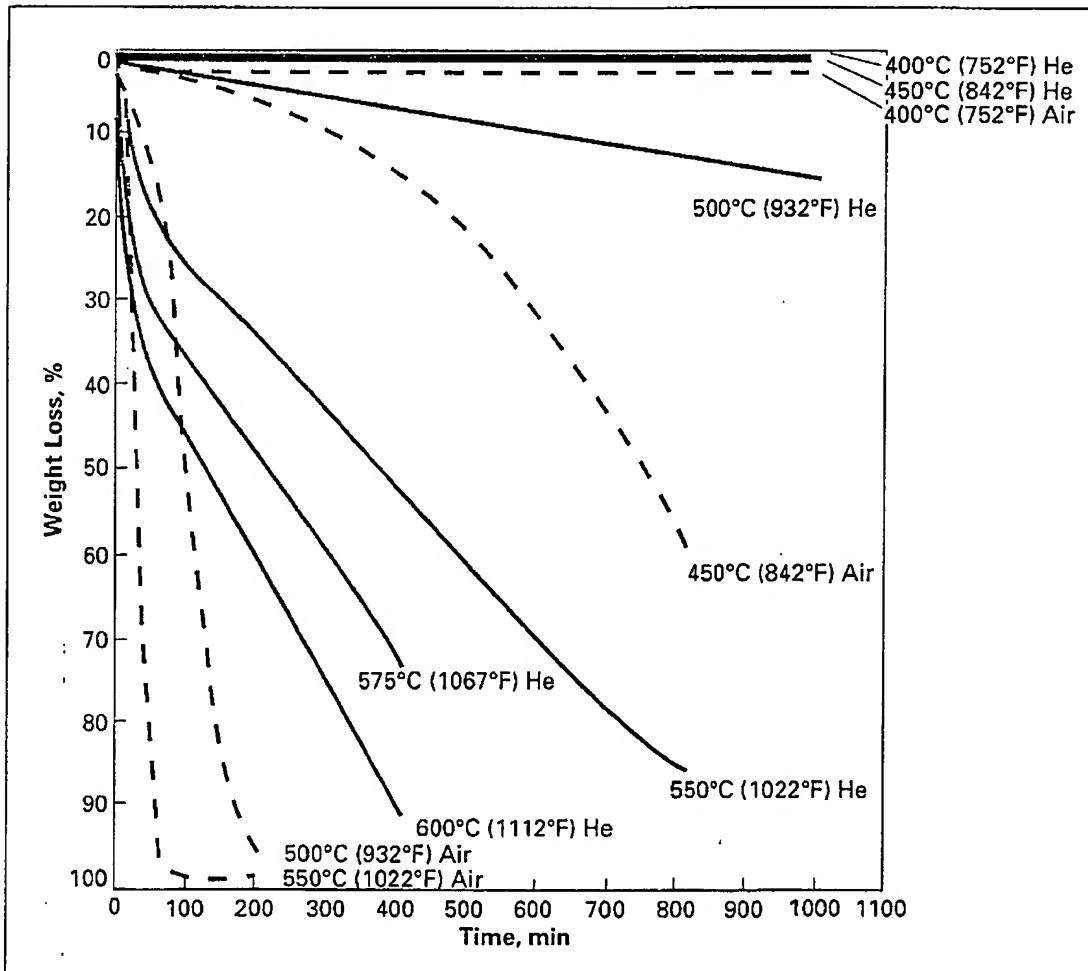


*Rate of temperature rise in °C (°F) was 3°C/min (5.4°F/min).

Table 6
Time Required for Reduction in Ultimate
Elongation from 70% to 1%,
Type HN Film, 25 μ m (1 mil)

Temperature	Air Environment
450°C (840°F)	2 hours
425°C (800°F)	5 hours
400°C (750°F)	12 hours
375°C (710°F)	2 days
350°C (660°F)	6 days
325°C (620°F)	1 month
300°C (570°F)	3 months
275°C (530°F)	1 year
250°C (480°F)	8 years

Figure 10. Isothermal Weight Loss, Type HN Film, 25 μ m (1 mil)



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#139

CMS # 70190

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The MSDS format adheres to U.S. standards and regulatory requirements and may not meet regulatory requirements in other countries.

This information is based upon technical information believed to be reliable. It is subject to revision as additional knowledge and experience are gained.

"KAPTON" POLYIMIDE FILM, FLUOROCARBON-COATED (EXCLUDING FILLED TYPES)

KAP002

Revised 12-MAR-1999

Printed 12-MAY-2000

CHEMICAL PRODUCT/COMPANY IDENTIFICATION

Material Identification

Kapton is a registered trademark of DuPont.

Corporate MSDS Number : DU005414

Tradenames and Synonyms

"KAPTON" F, FN

"KAPTON" HRN

"KAPTON" HRN616ES

"KAPTON" XP

→ "KAPTON" TRN, TRT, TWT

"KAPTON" ZN

"KAPTON" 1100FC051-5

Company Identification

MANUFACTURER/DISTRIBUTOR

DuPont

"Kapton"/"Teflon" Customer Service

P.O. Box 89

Circleville, OH 43113

PHONE NUMBERS

Product Information : 1-800-237-4357

Transport Emergency : 1-800-424-9300

Medical Emergency : 1-800-441-3637

COMPOSITION/INFORMATION ON INGREDIENTS

Components

Material

INERT POLYIMIDE FILM

CAS Number

8

100

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Coated or laminated with:
POLYFLUOROCARBON 25067-11-2
or
POLYFLUOROCARBON 26655-00-5
or
POLYFLUOROCARBON 68258-85-5

Exposure limits for the following may apply:
DIMETHYL ACETAMIDE (residual in film) 127-19-5 <1
POLYIMIDE POLYMER (as nuisance dust) 25038-81-7

Components (Remarks)

All reportable ingredients are listed in the TSCA Chemical Substance Inventory.

HAZARDS IDENTIFICATION

Potential Health Effects

Before using "Kapton" Polyimide Films, read the bulletin on safe handling and use.

POTENTIAL HEALTH EFFECTS

INHALATION: Not a probable route of exposure for film.

For the polymer from which the film is made, DuPont recommends treating polymer dust as a nuisance particulate.

Vapors and fumes from heating "Kapton" fluorocarbon coatings above 275 deg C, or from smoking tobacco or cigarettes contaminated with fluorocarbon coatings may cause polymer fume fever, a temporary, flu-like illness of approximately 24 hours duration with fever, chills and sometimes cough.

SKIN CONTACT: No irritation is expected from handling film. Less than 1 ppm dimethyl acetamide was extracted from film by distilled water at 40 deg C for 4 hours.

EYE CONTACT: Not a probable route of exposure for film.

INGESTION: Not a probable route of exposure for film.

Though "Kapton" is not heated to degradation temperatures during normal use, heating "Kapton" fluorocarbon coatings to temperatures above 350 deg C can produce trace amounts of toxic and irritating gases/vapors of hydrogen fluoride, carbonyl fluoride, and possibly perfluoroisobutylene. These compounds can cause severe eye, skin and respiratory tract irritation. Inhalation can cause shortness of breath and other respiratory effects and symptoms may be delayed.

Carcinogenicity Information

None of the components present in this material at concentrations equal to or greater than 0.1% are listed by IARC, NTP, OSHA or ACGIH as a carcinogen.

FIRST AID MEASURES

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First Aid

INHALATION

If exposed to fumes from overheating or combustion, move to fresh air. Consult a physician if symptoms persist.

SKIN CONTACT

Wash with soap and water after handling. If skin irritation develops, consult a physician.

EYE CONTACT

Flush eyes with plenty of water. Consult a physician if symptoms persist.

INGESTION

Not a probable route of exposure for films.

FIRE FIGHTING MEASURES

Flammable Properties

Not a fire or explosion hazard.

The flammability characteristic of polyimide film is reported as "self-extinguishing".

→ "Kapton" chars but does not burn in air. Coated types of "Kapton" will burn in an atmosphere of 95% oxygen when an ignition source is present. Combustion products include carbon monoxide, hydrogen fluoride, carbonyl fluoride and possibly perfluoroisobutylene.

The processing of "Kapton" polyimide films can cause the generation of static charge. Precautions for static charges should also be taken when removing plastic films used as protective packaging for "Kapton".

Extinguishing Media

Water, Foam, Dry Chemical, CO2.

Fire Fighting Instructions

Wear self-contained breathing apparatus and clothing to protect from hydrogen fluoride which reacts with water to form hydrofluoric acid. Wear Neoprene gloves when handling refuse from a fire involving fluorocarbon resins.

ACCIDENTAL RELEASE MEASURES

Safeguards (Personnel)

NOTE: Review FIRE FIGHTING MEASURES and HANDLING (PERSONNEL) sections before proceeding with clean-up. Use appropriate PERSONAL PROTECTIVE EQUIPMENT during clean-up.

Accidental Release Measures

Pick up to prevent slipping hazard.

HANDLING AND STORAGE

Handling (Personnel)

Wash thoroughly after handling.

Avoid contamination of tobacco products.

Storage

Store away from flammable materials.

EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls

Safe handling of "Kapton" polyimide films at high temperatures (above 200 deg C) requires adequate ventilation. If small quantities of "Kapton" are involved, normal air circulation may be all that is needed in case of overheating. Whether or not existing ventilation is adequate at higher temperatures will depend on the combined factors of film quantity, temperature and exposure time.

Personal Protective Equipment

Safety glasses are recommended as good industrial practice.

Respirators are not needed for normal use.

Special protective clothing is not needed for normal use. Gloves are recommended as good industrial practice.

Exposure Guidelines

Applicable Exposure Limits

POLYFLUOROCARBON

PEL (OSHA)	: None Established
TLV (ACGIH)	: None Established
AEL * (DuPont)	: 10 mg/m ³ , 8 & 12 Hr. TWA, total dust 5 mg/m ³ , 8 & 12 Hr. TWA, respirable dust

DIMETHYL ACETAMIDE (residual in film)

PEL (OSHA)	: 10 ppm, 35 mg/m ³ , 8 Hr. TWA, Skin
TLV (ACGIH)	: 10 ppm, 36 mg/m ³ , 8 Hr. TWA, Skin, A4
AEL * (DuPont)	: 10 ppm, 8 & 12 Hr. TWA, Skin

POLYIMIDE POLYMER (as nuisance dust)

PEL (OSHA)	: None Established
TLV (ACGIH)	: None Established
AEL * (DuPont)	: 10 mg/m ³ , 8 Hr. TWA, total dust 5 mg/m ³ , 8 Hr. TWA, respirable dust

* AEL is DuPont's Acceptable Exposure Limit. Where governmentally imposed occupational exposure limits which are lower than the AEL are in effect, such limits shall take precedence.

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PHYSICAL AND CHEMICAL PROPERTIES

Physical Data

Melting Point	: None
% Volatiles	: 1% max
Solubility in Water	: Insoluble
Odor	: No odor
Form	: Transparent film
Color	: Light amber
Specific Gravity	: >1.4

STABILITY AND REACTIVITY

Chemical Stability

Stable at normal temperatures and storage conditions.

Fluorocarbon coatings react with finely divided metal powders and fluorine and related compounds (e.g. chlorine trifluoride).

Decomposition

"Kapton" fluorocarbon coatings may degrade at temperatures >350 deg C producing hydrogen fluoride and carbonyl fluorides.

ECOLOGICAL INFORMATION

Ecotoxicological Information

Aquatic Toxicity

Insoluble.

DISPOSAL CONSIDERATIONS

Waste Disposal

Landfill or incinerate in compliance with federal, state, and local regulations. Incinerator should be equipped with scrubber to remove acidic hydrogen fluoride from off-gases.

TRANSPORTATION INFORMATION

Shipping Information

DOT	
Proper Shipping Name	: NOT APPLICABLE
Hazard Class	: NOT REGULATED

REGULATORY INFORMATION

State Regulations (U.S.)

STATE RIGHT-TO-KNOW

No substances on the state hazardous substances list, for the states indicated below, are used in the manufacture of products on

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